

CLAIMS

- 1 1. A method of adaptively managing bandwidth among a plurality of services contending
2 for bandwidth on an optical link having a bandwidth capacity, the method comprising:
3 allocating bandwidth to each service contending for bandwidth of the optical link;
4 computing for each service a current utilization metric representing a measure of
5 current usage of the allocated bandwidth by that service; and
6 allocating additional bandwidth to one of the services in response to the current
7 utilization metric of that service if bandwidth usage of the optical link is currently at less
8 than full capacity, otherwise balancing the bandwidth allocation between the services in
9 response to the current utilization metric of at least one of the services if the bandwidth
10 usage of the optical link is currently at full capacity.
- 1 2. The method of claim 1, wherein each service is a Gigabit Ethernet service.
- 1 3. The method of claim 1, further comprising computing for each service a utilization metric
2 representing a measure of current usage of a maximum allowed bandwidth for that
3 service, and wherein the balancing includes changing the bandwidth allocations to the
4 services such that the utilization metrics of the services are made approximately equal to
5 each other.
- 1 4. The method of claim 1, further comprising associating an adjustment limit parameter
2 with each service to control when to increase the bandwidth allocated to that service.

- 1 5. The method of claim 4, wherein the step of allocating additional bandwidth to one of the
2 services occurs if the current utilization metric exceeds a threshold based on the
3 adjustment limit parameter for that service.
- 1 6. The method of claim 1, wherein the additional bandwidth allocated to one of the services
2 is a granularity of an STS-1 path.
- 1 7. The method of claim 1, further comprising using Link Capacity Adjustment Schemes
2 (LCAS) technology to allocate additional bandwidth to one of the services when usage of
3 the optical link is at less than full capacity.
- 1 8. The method of claim 1, further comprising associating a full utilization metric with each
2 service to determine a maximum bandwidth allocation for each service and a priority
3 between the services to be used when balancing.
- 1 9. The method of claim 1, further comprising generating, for each service, a services-of-
2 interest list for identifying one or more services with which that service contends for the
3 bandwidth of the optical link.
- 1 10. A method of adaptively managing bandwidth among a plurality of services contending
2 for bandwidth on an optical link having a bandwidth capacity, the method comprising:
3 allocating bandwidth to each service contending for bandwidth on the optical link;
4 determining for each service a current utilization metric representing a current
5 usage by that service of the bandwidth allocated to that service; and

6 balancing the bandwidth allocation between the services if the current utilization
7 metric of at least one of the services exceeds a specified threshold and usage of the
8 bandwidth of the optical link is currently at full capacity.

1 11. The method of claim 10, further comprising computing for each service a utilization
2 metric representing a measure of current usage of a maximum allowed bandwidth for that
3 service.

1 12. The method of claim 11, wherein the step of balancing includes changing the bandwidth
2 allocations to the services such that the utilization metrics of the services are made
3 approximately equal to each other.

1 13. The method of claim 10, wherein the step of balancing includes removing bandwidth
2 from one of the services and allocating the removed bandwidth to another one of the
3 services.

1 14. The method of claim 10, further comprising associating an adjustment limit parameter
2 with each service and allocating additional bandwidth to one of the services if the current
3 utilization metric exceeds a threshold based on the adjustment limit parameter for that
4 service and usage of the bandwidth of the optical link is currently less than full capacity.

1 15. The method of claim 10, further comprising associating a full utilization metric with each
2 service to determine a maximum bandwidth allocation for each service and a priority
3 between the services to be used when balancing.

1 16. A network, comprising:
2 a plurality of network elements connected to each other by optical links;

3 a first path for carrying traffic associated with a first service through the network,
4 the first path extending through the network over at least one of the optical links;

5 a second path for carrying traffic associated with a second service, the second
6 path extending through the network over at least one of the optical links, the second path
7 having a link in common with the first path;

8 wherein a first one of the network elements allocates a portion of the bandwidth
9 of the common link to the first service and a second one of the network elements
10 allocates a portion of the bandwidth of the common link to the second service, each of the
11 first and second network elements determining for the first and second services,
12 respectively, a current utilization metric representing a current usage by that service of
13 the bandwidth allocated to that service, the first and second network elements balancing
14 the bandwidth allocated to the services if the current utilization metric of at least one of
15 the services exceeds a specified threshold and usage of the bandwidth of the common link
16 is currently at full capacity.

1 17. The network of claim 16, further comprising a central controller for sending messages to
2 the network elements that direct the balancing of the bandwidth allocated to the services.

1 18. The network of claim 16, wherein the network is a ring network.

1 19. The network of claim 16, wherein the network is a linear network.

1 20. The network of claim 16, wherein the first and second network elements each maintain a
2 services-of-interest list for identifying one or more services with which that service
3 contends for the bandwidth of the optical link.